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1.0 *Technology Description & Options*

The URS Corporation (URS), formally Radian International, LLC is pleased to submit description of the Absorber Liquid Redistribution Device (ALRD) for installation in the Intermountain Power Project FGD systems. The patent pending technology proposed is a technology exclusively licensed from Marsulex Environmental Technologies, LLC (MET) for all retrofit applications. The URS design uses the technical know-how and operating experience as developed by MET.

Recent testing in the FGD industry has indicated that the majority of the SO_2 escaping an open spray tower escapes from an annular region extending in from the wall five feet toward the center of the vessel. Refer to Figure 1 below.

The basic premise of this technology is that Region 2 of the absorber vessel has a substantially lower spray density overlap due to the immediate presence of the wall than does Region 1. The physical phenomena present suggests that a large fraction of liquid slurry introduced in Region 2 hits the wall and eventually flows down along the wall creating a relative low mass transfer surface area with the gas. It has been estimated, through field testing, that this phenomena can result in a loss of as much as 20%-25% of the liquid recycle slurry being ineffective. Refer to Figure 2. The proposed technology is designed to strip the liquid off of the wall and re-introduce the slurry back into the gas phase in the area of the lowest spray density. Refer to Figure 3. This increases the effective L/G by as much as 15%-20%.

Figure 1: Annular Region

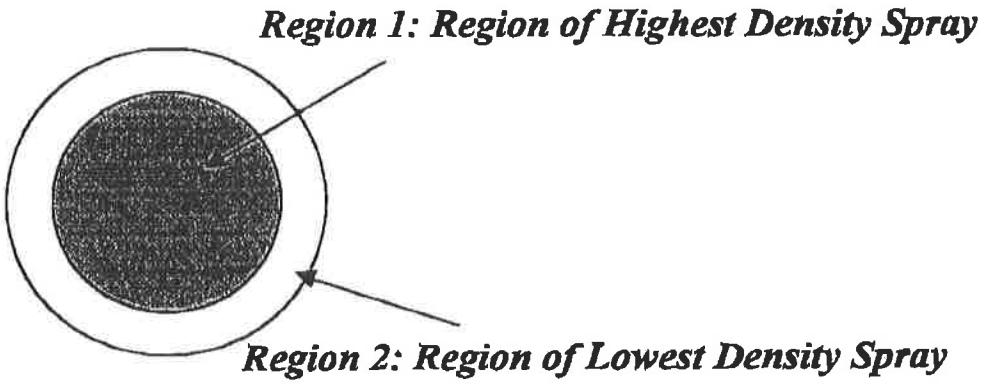

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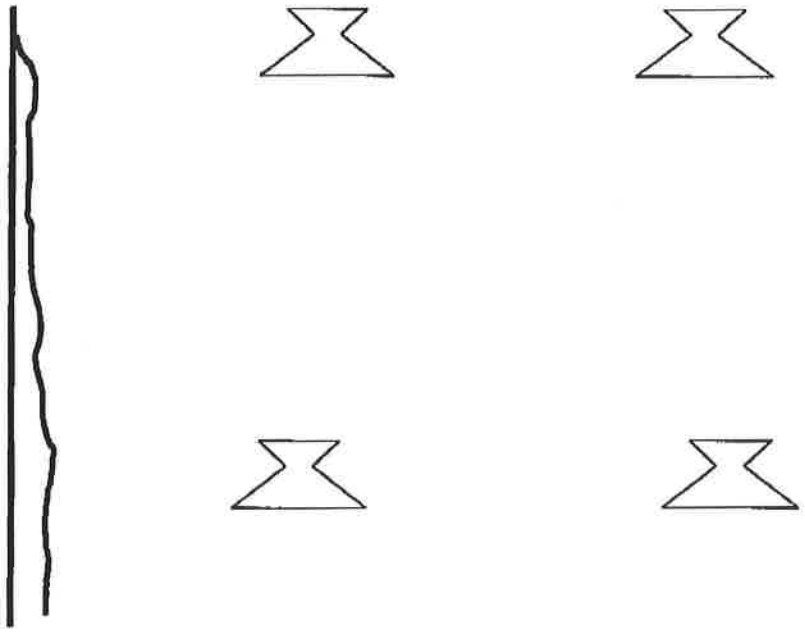
Figure 2: Liquid Flow Along the Wall Without ALRD



The presence of the Absorber Liquid Redistribution Devices takes the liquid running down the wall and reintroduces into the gas phase as shown in Figure 3.

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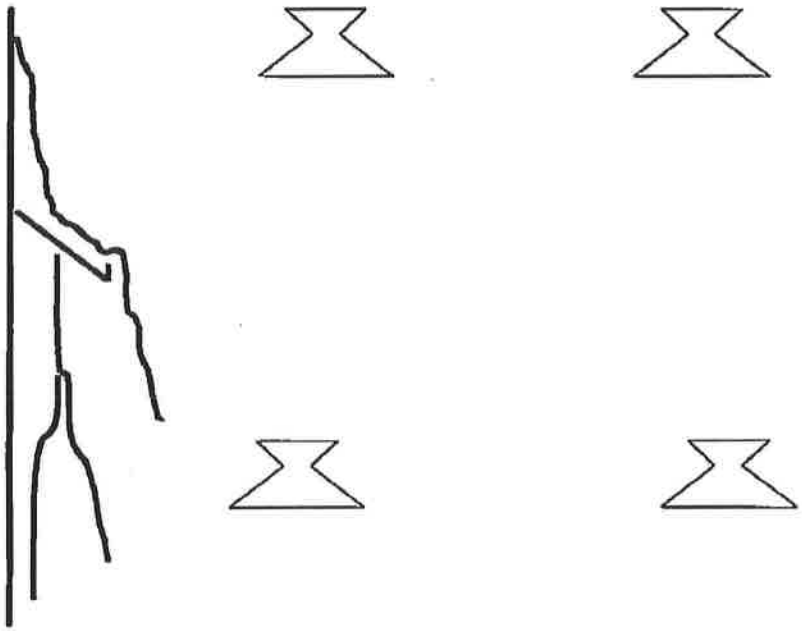
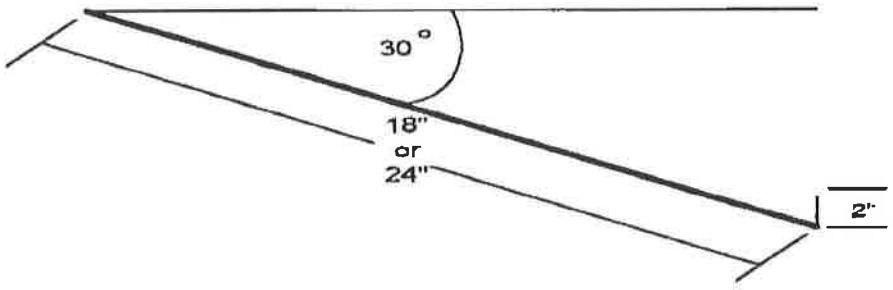
Figure 3: Liquid Flow Along Wall With ALRD



The introduction of the liquid flowing along the wall is not 100% effective because the slurry droplets are not atomized as finely as a spray nozzle would atomize them. The net result however is a demonstrated improvement in SO_2 removal.

The ALRD proposed for the W.A. Parish Unit 8 FGD system, consist of two rings which are each 18 inches long, extending at a down angle of 30° from the horizontal perpendicular to the absorber wall, located equidistant between spray levels 1 and 2 and 2 and 3. The ALRD is shown pictorially in Figure 4.

Figure 4: Absorber Liquid Redistribution Device



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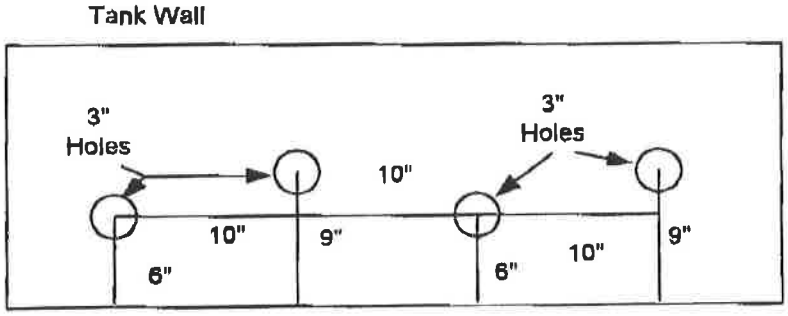
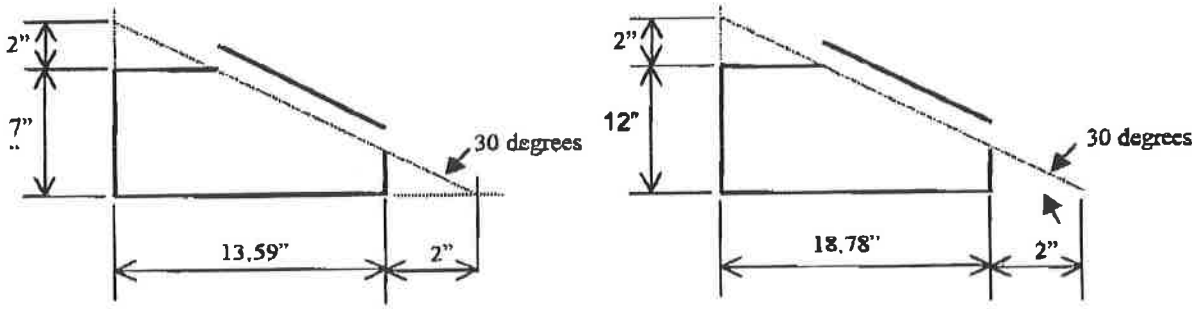
The device as proposed by URS is unique in that the angle of plate becomes important to insure that the plate remain free of build up. To aid in both the atomization and even re-distribution of the slurry flowing along the wall, the ALRD plates contain several three-inch holes located approximately ten inches center to center. Refer to Figure 5. The three-inch holes allow slurry to drain from the ALRD and allow for gas to penetrate the ALRD through the holes generating an intimate gas-liquid contact. As can be deduced from Figure 4, each ALRD has a two-inch field welded lip on the end. This allows the slurry flowing on ALRD to be re-introduced into the gas phase evenly by using an overflow method. This overflow method also creates an excellent edge where a portion of the gas shears off and atomizes the slurry. These two methods of re-introducing the slurry back into the gas phase improve SO_2 removal.

Figure 5: Gas-Liquid Contact Holes in ALRD



The devices will be welded along the wall edge and supported by brackets approximately every three to four feet. A typical bracket configuration is shown in Figure 6.

Figure 6: Typical Bracket Configuration



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2.0 *Experience List*

The application of the ALRD is relatively new as the technology was only invented in 1996. The application of the ALRD has taken place in four vessels in which the URS licensor, MET has been involved. These installations are included below.

The specific SO_2 removal performance improvement is both proprietary and customer confidential. The one application of the technology on a retrofit basis showed substantial improvement in SO_2 removal. The other applications of the technology were on new installations not operated without the ALRD installed. The initial application was used to develop a proprietary mathematical model for predicting the SO_2 removal performance above the current or expected tower performance without the ALRD installed.

Experience:

Dakota Gasification Company
Beulah North Dakota
350 MW (gas equivalent) Absorber (43.0 ft), Prescrubber (27.0 ft)
Operation Since 1997

KEPCO
Taean Units 5 & 6
Korea
2x350 MW Absorber (42.9 ft)
Operation 2001

Pha Lai Power Project Units 1 & 2
Republic of Vietnam
2x250 MW Absorber (30.5 ft)
Operation 2001

Virginia Power Company
Mt Storm Station
Units 1&2
2x550 MW Absorber (55.3 ft)
Operation 2001